

A faint background diagram of a particle detector. It shows a central 'Primary Vertex' (a green circle) and a 'Secondary Vertex' (a red circle). Arrows represent particle tracks, with some labeled 'Lx'. A shaded region is labeled 'Displaced Tracks'. A dashed line is labeled 'd0'.

# HF topical group plans for tracker review

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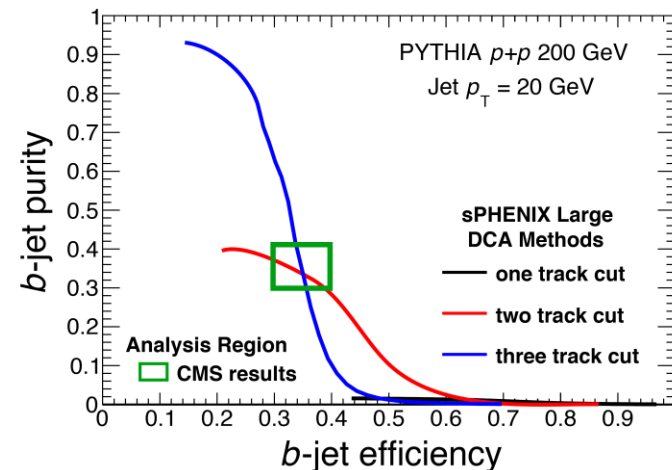
# One page summary

## ► Target B-jet tagging performance plots

- High DCA track counting : (see next slides)
  - Establishing G4-based procedure beyond fast sim.
- Secondary vertex: (see next slides)
  - Developing RAVE based secondary vertex finder.
  - Hopefully to be established as a second B-tagger for the review
- Reevaluate tagging in central Au+Au embedded events:
  - Require re-optimization of cuts
  - Computing cost manageable: half day for 10k samples in private productions

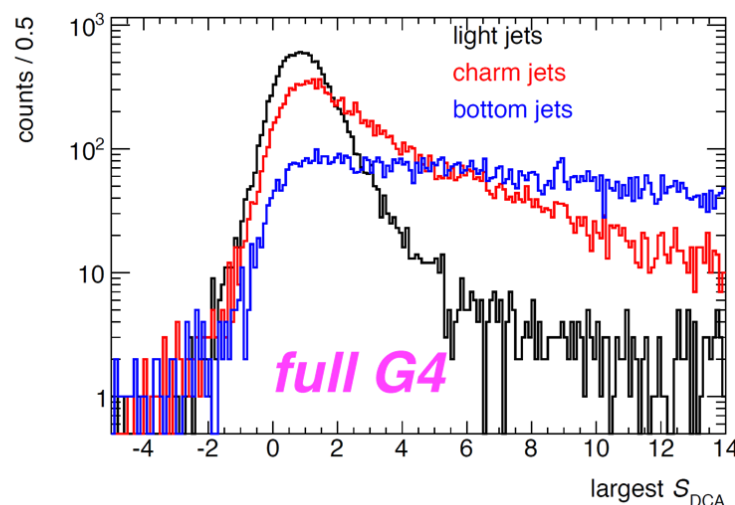
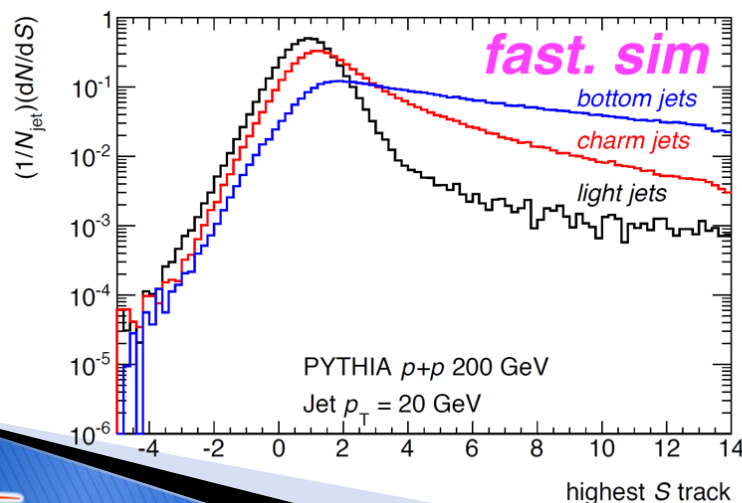
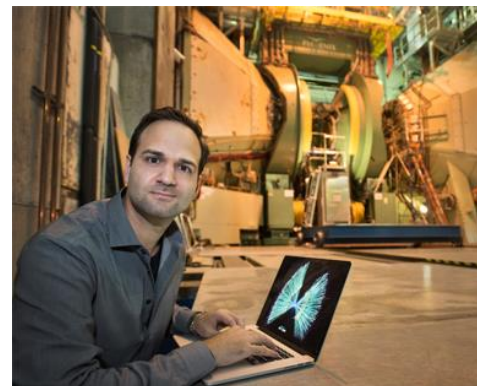
## ► Dependence on tracking software development

- Simulation represent **efficiency, quality and purity** of track in a defensible way:
  - Implementation of pile up, cluster quality control and distortion
- Inner tracker: **DCA resolution and tails**
  - Wish item: implement **ladder geometry** for silicon tracker instead of cylinders, modeling shape of DCA with uneven material distribution and possible problems
- Outer tracker: momentum vector **resolution** ( $\Delta p/p$  and angular):
  - Secondary vertex mass and vertex  $p_T$
  - Comparing to Upsilon program, could have less requirement on  $dp/p$  but stronger requirement on angular resolution (using both inner + outer trackers)



# B-jet tagging – High DCA track counting

- ▶ Recent progress
  - Dennis implemented tagging in full Geant4 simulation, under testing
- ▶ Plan next:
  - Verification of G4 tagger performance in pp
  - Helper during Dennis' relocation



# B-jet tagging – Secondary vertex

## ► Recent progress

- Haiwang developed new Kalman filter (GenFit2) with vertex finder integration (RAVE)
- Sanghoon tested options of secondary vertex finding in B-production event (for full-maps tracker). Result promising

## ► Plan next:

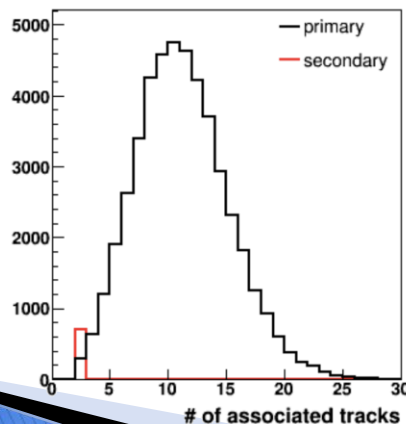
- Secondary vertex finder in jet: 1-2 week?
- Implement cut on secondary vertex significance and mass fit



### p+p event with light quark-jets

- Pythia8 pTHatMin = 25 GeV
- 7layer MAPS → sPHENIX Geant4 → GenFit2 → RAVE

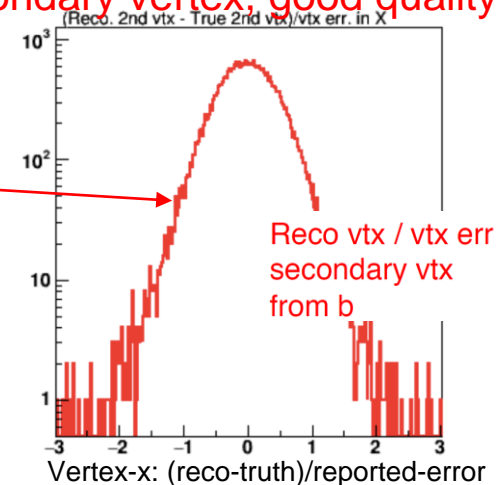
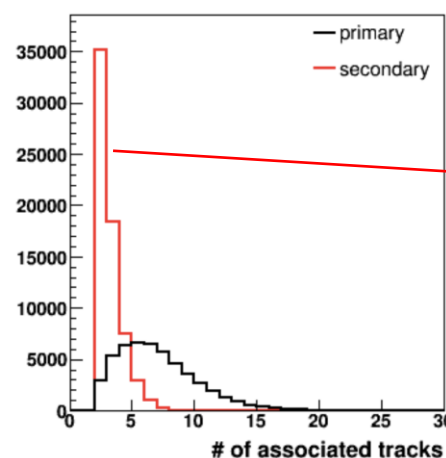
**Very few secondary vertex found**



### p+p event with b-quark production

- Pythia8 HardQCD:bbbar
- 7layer MAPS → sPHENIX Geant4 → GenFit2 → RAVE

**84% event has secondary vertex, good quality**



# From previous meetings





# High priority longer-term tasks

- ▶ Goal: realistic study of HF jet performance in sPHENIX simulation and reconstruction.
- ▶ Target time scale: tracking review
- ▶ High priority development tasks (help wanted):
  - Realistic implementation in Geant4
    - Tony F./Gaku M./Chris P., lots of progress
  - Generalized Kalman filter
    - Haiwang Y./Chris P., close to completion
  - Multi-vertexing/B-tagging via secondary vertexing in jet
    - Sanghoon L./Haiwang Y.: exploring RAVE option
  - B-jet tagging: Track Counting
    - Dennis P.: lots of progress in past weeks
  - B-jet tagging: Soft Lepton Tagging
    - Jin H. (+ Help)
  - B-jet tagging: B-Meson Tagging
    - Volunteer needed!